Report from the Airplane Performance Harmonization Working Group

1 – Statement of Task

Within one year of publication of the ARAC task in the Federal Register, develop recommendations for common (harmonized) operational requirements for those items identified under item 2 (Task 2) above as being feasible for harmonization. If the HWG determines FAA rulemaking is required, that determination must be forwarded to the FAA for consideration of rulemaking priority, resource allocation, and additional tasking to ARAC, as appropriate.

2 – Action taken

The HWG realized very early in the process that it could not meet the requirement to develop recommendations within one year. An extension to December 2000 was granted by ARAC.

The HWG discussed all of the differences in great detail. After consultation with ARAC, it was decided to submit the HWG's recommendations using the "fast track" report format. Seventeen reports were developed, covering all of the items identified as candidates for harmonization, as well as those not selected for harmonization. Each report provides the recommended changes to the standards and the rationale behind each change.

3 – Results

A document, using a format similar to that used in the comparison document developed under Task 1, was developed to summarize the proposed harmonized airplane operating requirements. This document is provided below. The document lists the proposed JAR requirement, the corresponding proposed FAR requirement and the HWG report that contains the details of the proposal.

The seventeen HWG reports are provided as attachments to this report.

JAR-OPS 1.010 Exemptions	FAR 121.173(f)	Comments
The Authority may exceptionally and temporarily grant an exemption from the provisions of JAR-OPS Part 1 when satisfied that there is a need and subject to compliance with any supplementary condition the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.	The Administrator may authorize in the operations specifications deviations from the requirements of this subpart if special circumstances make a literal observance of a requirement unnecessary for safety.	
JAR-OPS 1.400 Approach and Landing Conditions (See IEM OPS 1.400) (a) Before commencing an approach to land, the commander must satisfy himself that, according to the information available to him, including the weather at the aerodrome, ~~and~~ the condition of the runway intended to be used, and considering any inflight failures of systems which affect landing distance, should not prevent a safe approach, landing or missed approach, having regard to the performance information contained in the Operations Manual. (b) If the condition of the runway intended to be used for landing is contaminated, the landing distance must be at least the landing distance determined in accordance with JAR-OPS 1.520(a), or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater. (c) If the aeroplane was despatched in accordance with JAR-OPS 1.515(d), the commander must, in addition, satisfy himself before commencing an approach to land at the destination aerodrome that a landing can be made in full compliance with JAR-OPS 1.510 and JAR-OPS 1.515(a) and (b).	**FAR 121.601 Aircraft Dispatcher Information to Pilot in Command: Domestic and Flag Operations** (c) During a flight, the aircraft dispatcher shall provide the pilot in command any additional available information of meteorological conditions (including, adverse weather phenomena, such as clear air turbulence, thunderstorms, and low altitude wind shear), and irregularities of facilities and services, that may affect the safety of the flight. **FAR 121.603 Facilities and Services: Supplemental Operations** (b) During a flight, the pilot in command shall obtain any additional available information of meteorological conditions and irregularities of facilities and services that may affect the safety of the flight.	Working Group Report 16

JAR-OPS 1.470 Applicability	**121.171 Applicability**	Working Group Report 1
(a) An operator shall ensure that multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg and all multi-engine turbojet powered aeroplanes are operated in accordance with Subpart G (Performance Class A). (b) An operator shall ensure that propeller driven aeroplanes with a maximum approved passenger seating configuration of 9 or less, and a maximum take-off mass of 5700 kg or less are operated in accordance with Subpart H (Performance Class B). (c) An operator shall ensure that aeroplanes powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg are operated in accordance with Subpart I (Performance Class C). (d) Where full compliance with the requirements of the appropriate Subpart cannot be shown due to specific design characteristics (e.g. supersonic aeroplanes or seaplanes), the operator shall apply approved performance standards that ensure a level of safety equivalent to that of the appropriate Subpart. (e) Multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 and with a maximum take-off mass of 5700 kg or less may be permitted by the Authority to operate under alternative operating limitations to those of Performance Class A which shall not be less restrictive than those of the relevant requirements of Subpart H. (f) The provisions of subparagraph (e) above will expire on 31 December 2004 in respect of such aeroplanes as were registered in a JAA member state before 1 April 2000~~The provisions of subparagraph (e) above will expire on 1 April 2000~~.	**121.171 Applicability** (b) Except as provided in paragraph (d) of this section, each certificate holder operating a reciprocating-engine-powered airplane shall comply with §§ 121.175 through 121.187. (c) Except as provided in paragraph (d) of this section, each certificate holder operating a turbine-engine-powered airplane shall comply with the applicable provisions of §§ 121.189 through 121.197, except that when it operates– (1) A turbo-propeller-powered airplane type certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, the certificate holder may comply with §§ 121.175 through 121.187; or (2) Until December 20, 2010, a turbo-propeller-powered airplane described in § 121.157(f), the certificate holder may comply with the applicable performance requirements of appendix K of this part. (d) Each certificate holder operating a large nontransport category airplane type certificated before January 1, 1965, shall comply with §§ 121.199 through 121.205 and any determination of compliance must be based only on approved performance data.	

JAR-OPS 1.475 General	**FAR 121.173 General**	Working Group Report 1
(a) An operator shall ensure that the mass of the aeroplane: (1) At the start of the takeoff; or, in the event of in-flight replanning (2) At the point from which the revised operational flight plan applies, Is not greater than the mass at which the requirements of the appropriate Subpart can be complied with for the flight to be undertaken, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is provided for in the particular requirement.		
(b) An operator shall ensure that the approved performance data contained in the Aeroplane Flight Manual is used to determine compliance with the requirements of the appropriate Subpart, supplemented as necessary with other data acceptable to the Authority as prescribed in the relevant Subpart. When applying the factors prescribed in the appropriate Subpart, account may be taken of any operational factors already incorporated in the Aeroplane Flight Manual performance data to avoid double application of factors. (See AMC OPS 1.475(b) & IEM OPS 1.475(b)).	(~~d~~a) The performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 121.175 through 121.197. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables if the results of the interpolation or computations are substantially as accurate as the results of direct tests. (b) When applying the operational factors required by the applicable provisions of §§ 121.189 through 121.197, account may be taken of any operational factors already incorporated in the performance data to avoid double application of factors.	
(c) When showing compliance with the requirements of the appropriate Subpart, due account shall be taken of aeroplane configuration, environmental conditions and the operation of systems which have an adverse effect on performance. ~~(d) For performance purposes, a damp runway, other than a grass runway, may be considered to be dry.~~		

	FAR ~~121.171~~ ~~Applicability~~ (~~b~~) For the purposes of this part, *effective length of the runway* for landing means the distance from the point at which the obstruction clearance plane associated with the approach end of the runway intersects the centerline of the runway to the far end thereof. (~~c~~) For the purposes of this subpart, *obstruction clearance plane* means a plane sloping upward from the runway at a slope of 1:20 to the horizontal, and tangent to or clearing all obstructions within a specified area surrounding the runway as shown in a profile view of that area. In the plan view, the centerline of the specified area coincides with the centerline of the runway, beginning at the point where the obstruction clearance plane intersects the centerline of the runway and proceeding to a point at least 1,500 feet from the beginning point. Thereafter the centerline coincides with the takeoff path over the ground for the runway (in the case of takeoffs) or with the instrument approach counterpart (for landings), or, where the applicable one of these paths has not been established, it proceeds consistent with turns of at least 4,000 foot radius until a point is reached beyond which the obstruction clearance plane clears all obstructions. This area extends laterally 200 feet on each side of the centerline at the point where the obstruction clearance plane intersects the runway and continues at this width to the end of the runway; then it increases uniformly to 500 feet on each side of the centerline at a point 1,500 feet from the intersection of the obstruction clearance plane with the runway; thereafter it extends laterally 500 feet on each side of the centerline.	Working Group Report 1
JAR-OPS 1.480 Terminology (a) Terms used in Subparts F, G, H, I and J, and not defined in JAR-1, have the following meaning: (1) *Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of stopway, if such stopway is declared available by the appropriate Authority ~~and is capable of bearing the mass of the aeroplane under the prevailing operating conditions~~. (2) (3) *Landing distance available (LDA).* The length of the runway which is declared available by the appropriate Authority ~~and is suitable for the~~		

~~ground run of an aeroplane landing~~. (4) *Maximum approved passenger seating configuration.* The maximum passenger seating capacity of an individual aeroplane, excluding pilot seats or flight deck seats and cabin crew seats as applicable, used by the operator, approved by the Authority and specified in the Operations Manual. (5) (i) *Contaminated runway.* A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following: (A) ~~Surface~~ water ~~more than 3 mm (0.125 in) deep,~~ or ~~by~~ slush, ~~or loose snow, equivalent to~~ more than 3 mm (0.125 in) ~~of water~~; (B) ~~S~~now ~~which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow~~); or (C) ~~I~~ce, including wet ice. ~~*Damp runway.* A runway is considered damp when the surface is not dry, but when the moisture on it does not give it a shiny appearance.~~ (ii) *Dry runway.* A dry runway is one ~~which is neither wet nor contaminated, and includes those paved runways which have been specially prepared with grooves or porous pavement and maintained to retain 'effectively dry' braking action even when moisture is present~~. (iii) *Wet runway.* ~~A runway is considered wet when the runway surface is covered with water, or equivalent, less than specified in subparagraph (a)(2) above or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.~~ (6) *Take-off distance available (TODA).* The length of the take-off run available plus the	.	Working Group Report 1

length of the clearway ~~available~~ if such clearway is declared available by the appropriate Authority. (7) *Take-off mass.* The take-off mass of the aeroplane shall be taken to be its mass, including everything and everyone carried at the commencement of the take-off run. (8) *Take-off run available (TORA).* The length of runway which is declared available for the ground run of an aeroplane taking off by the appropriate Authority. (b) The terms 'accelerate-stop distance', 'take-off distance', 'take-off run', 'net take-off flight path', 'one engine inoperative en-route net flight path' and 'two engines inoperative en-route net flight path' as relating to the aeroplane have their meanings defined in the airworthiness requirements under which the aeroplane was certified, or as specified by the Authority if it finds that definition ~~inadequate~~ for showing compliance with the performance operating limitations.	**FAR 121.189** (~~g~~) For the purposes of this section the terms, "accelerate-stop distance," "takeoff distance," 'takeoff run," "net takeoff flight path," and 'takeoff path," have the same meanings as set forth in the rules under which the airplane was certificated, or as specified by the Administrator if that definition is found unsuitable for showing compliance with the performance operating limitations.	Working Group Report 2

	FAR 121.173 General	Working Report 1
	~~(a) Except as provided in paragraph (c) of this section, each certificate holder operating a reciprocating-engine-powered airplane shall comply with §§ 121.175 through 121.187.~~	
	~~(b) Except as provided in paragraph (c) of this section, each certificate holder operating a turbine-engine-powered airplane shall comply with the applicable provisions of §§ 121.189 through 121.197, except that when it operates—~~	
	~~(1) A turbo-propeller-powered airplane type certificated after August 29, 1959, but previously type certificated with the same number of reciprocating engines, the certificate holder may comply with §§ 121.175 through 121.187; or~~	
	~~(2) Until December 20, 2010, a turbo-propeller-powered airplane described in § 121.157(f), the certificate holder may comply with the applicable performance requirements of appendix K of this part.~~	
	~~(c) Each certificate holder operating a large nontransport category airplane type certificated before January 1, 1965, shall comply with §§ 121.199 through 121.205 and any determination of compliance must be based only on approved performance data.~~	
JAR-OPS 1.485 General		
(a) An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority ~~if the approved performance data in the Aeroplane Flight Manual is insufficient~~ in respect of items such as:	(~~d~~a) The performance data in the Airplane Flight Manual, supplemented as necessary with other data acceptable to the Administrator, applies in determining compliance with §§ 121.175 through 121.197. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables, if the results of the interpolation or computations are substantially as accurate as the results of direct tests.	
(1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and		
(2) Consideration of engine failure in all flight phases.		
(b) ~~An operator shall ensure that for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used.~~ For the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591, or other data ensuring a similar level of safety acceptable to the Authority must be used. (See IEM OPS 1.485(b)).	No corresponding requirement.	

JAR-OPS 1.490 Take-off	**FAR 121.189 Airplanes: Turbine Engine Powered: Takeoff Limitations**	
(a) An operator shall ensure that the take-off mass does not exceed the maximum take-off mass specified in the Aeroplane Flight Manual for the pressure altitude and the ambient temperature at the aerodrome at which the take-off is to be made.	(a) No person operating a turbine engine powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual for the ~~elevation~~ pressure altitude ~~of~~ at the airport and the ambient temperature existing at takeoff.	Working Group Report 2
(b) An operator must meet the following requirements for the runway to be used when determining the maximum permitted take-off mass:	(c) No person operating a turbine engine powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that ~~listed in the Airplane Flight Manual~~ at which compliance with the following may be shown for the runway to be used:	
(1) The accelerate-stop distance must not exceed the accelerate-stop distance available;	(1) The accelerate-stop distance must not exceed the ~~length of the runway plus the length of any stopway~~ accelerate-stop distance available.	
(2) The take-off distance must not exceed the take-off distance available, with a clearway distance not exceeding half of the take-off run available;	(2) The takeoff distance must not exceed the ~~length of the runway plus the length of any clearway~~ takeoff distance available with ~~except that the length of~~ any clearway distance not exceeding half of the takeoff run available.~~included must not be greater than one-half the length of the runway.~~	
(3) The take-off run must not exceed the take-off run available;	(3) The takeoff run must not be greater than the ~~length of the runway~~takeoff run available.	
	[Note: The working group did not reach consensus on harmonization of the following paragraph:]	
	For contaminated runway accountability on a one-engine-inoperative performance basis:	
(4) Compliance with this paragraph must be shown using the same ~~a single~~ value of V_1 for the rejected and continued take-off; and	(4) ~~(4)~~ The same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section.	Working Group Report 4
	For contaminated runway accountability on all engines-operating performance basis:	
	(4) For runways that are dry or wet, the same value of V_1 must be used to show compliance with paragraphs (c)(1) through (c)(3) of this section. For contaminated runways, V_{Stop} must be used to show compliance with paragraph (c)(1) of this section.	Working Group Report 5
(5) On a wet or contaminated runway, the take-off mass must not exceed that permitted for a	(5) On a wet or contaminated runway, the takeoff weight must not exceed that	Working Group Report 2

take-off on a dry runway under the same conditions.	permitted for takeoff on a dry runway under the same conditions.	Working Report 2
(c) When showing compliance with subparagraph (b) above, an operator must take account of the following:	(e) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for– ~~the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.~~	
(1) The pressure altitude at the aerodrome.	(1) The pressure altitude at the airport;	
(2) The ambient temperature at the aerodrome and	(2) The ambient temperature at the airport;	
(3) The runway surface condition and the type of runway surface (See IEM OPS 1.490(c)(3)).	(3) The runway surface condition (dry, wet, or contaminated) and the type of runway surface (paved or unpaved);	
(4) The runway slope in the direction of take-off;	(4) The runway slope in the direction of takeoff;	
(5) Not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component; and	(5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and	Working Group Report 3
(6) The loss, if any, of runway length due to alignment of the aeroplane prior to take-off. (See IEM OPS 1.490(c)(6).)	(6) The loss, if any, of takeoff run available, takeoff distance available, and accelerate-stop distance available due to aligning the airplane on the runway prior to takeoff.	
IEM No. 2 OPS 1.490(c)(3) – Type of Runway Surface (Grooved and Porous Friction Course).	~~No corresponding requirement.~~	
Where an identified paved runway has been prepared and maintained with a grooved or porous friction course (PFC) in accordance with a standard such as FAA AC 150//5320-12C, or other equivalent acceptable to the Authority, performance credit may be taken, provided that approved performance data is in the AFM and is identified as appropriate for use in conjunction with a grooved or PFC runway.	(f) Wet runway accelerate-stop distances associated with grooved or porous friction course runways may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay.	Working Group Report 2

JAR-OPS 1.495 Take-off Obstacle Clearance	**FAR 121.189 (continued)**	
(a) An operator shall ensure that the net take-off flight path clears all obstacles by a vertical distance of at least 35 ft or by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance the aeroplane has travelled from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available. For aeroplanes with a wingspan of less than 60 m a horizontal obstacle clearance of half the aeroplane wingspan plus 60 m, plus 0.125 x D may be used. (See IEM OPS 1.495(a).)	(d) No person operating a turbine engine powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual -	Working Group Report 6
	(2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path, that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.	
(b) When showing compliance with subparagraph (a) above, an operator must take account of the following: (1) The mass of the aeroplane at the commencement of the take-off run; (2) The pressure altitude at the aerodrome; (3) The ambient temperature at the aerodrome; and (4) Not more than 50% of the reported head-wind component or not less than 150% of the reported tailwind component.		
(c) When showing compliance with subparagraph (a) above: (1) Track changes shall not be allowed up to the point at which the net take-off flight path has achieved a height equal to one half the wingspan but not less than 50 ft above the elevation of the end of the take-off run ~~available~~. Thereafter, bank angles up to 15° below 100 feet, up to 20° between 100 feet and 400 feet, and up to 25° above 400 feet may be used if approved methods are used to account for the effects of bank angle. Larger bank angles may not be used unless approved by the Authority. ~~up to a height of 400 ft it is assumed that the aeroplane is banked by no more than 15°. Above 400 ft height bank angles greater than 15°, but not more than 25° may be scheduled.~~	~~(f)~~(h) For the purposes of this section, ~~it is assumed that~~ the airplane ~~is~~ shall not be banked before reaching a height equal to one half the wingspan, but not less than ~~of~~ 50 feet, as shown by the takeoff path or net takeoff flight path data (as appropriate) in the Airplane Flight Manual.~~, and~~ Tthereafter, ~~that the maximum~~ bank angles up to~~is not more than~~ 15 degrees below 100 feet,~~,~~ up to 20 degrees between 100 feet and 400 feet, and up to 25 degrees above 400 feet may be used if approved methods are used to account for the effects of bank angle. Larger bank angles may not be used unless approved by the Administrator**.**	Working Group Report 7
(2) Any part of the net take-off flight path in which the aeroplane is banked by more than 15° must clear all obstacles within the horizontal distances specified in subparagraphs (a), (d) and (e) of this paragraph by a vertical distance of at ~~least 50 ft,~~ 35 feet relative to the lowest part of the banked aeroplane, and	(i) When a bank angle of more than 15 degrees is used to show compliance with paragraph (d)(2) of this section, the vertical obstacle clearance requirement for that portion of the net flight path in which the bank angle is greater than 15 degrees shall be at least 35 feet relative to a net takeoff flight path corresponding to the	Working Group Report 8

(3) An operator must use special procedures, subject to the approval of the Authority, to apply increased bank angles of not more than 20° between 100 ~~200~~ ft and 400 ft, or not more than 30° above 400 ft (See Appendix 1 to JAR-OPS 1.495(c)(3)).	lowest part of the banked airplane.	
(4) Adequate allowance must be made for the effect of bank angle on operating speeds and flight path including the distance increments resulting from increased operating speeds. (See AMC OPS 1.495(c)(4)).		
(d) When showing compliance with subparagraph (a) above for those cases where the intended flight path does not require track changes of more than 15º, an operator need not consider those obstacles which have a lateral distance greater than:	No corresponding requirement.	
(1) 300 m, if the pilot is able to maintain the required navigational accuracy through the [obstacle accountability area (See AMC OPS 1.495(d)(1) & (e)(1); or		
(2) 600 m for flights under all other conditions.		
(e) When showing compliance with subparagraph (a) above for those cases where the intended flight path does required track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:	No corresponding requirement.	
(1) 600 m, if the pilot is able to maintain the required navigational accuracy through the [obstacle accountability area (see AMC OPS 1.495(d)(1) & (e)(1)); or		
(2) 900 m for flights under all other conditions.		
(f) An operator shall establish contingency procedures to satisfy the requirements of JAR-OPS 1.495 and to provide a safe route, avoiding obstacles, to enable the aeroplane to either comply with the en-route requirements of JAR-OPS 1.500, or land at either the aerodrome of departure or at a take-off alternate aerodrome (See IEM OPS 1.495(f)).	(g) No person operating a turbine engine powered airplane may take off that airplane unless procedures have been established to maintain the obstacle clearance required by § 121.189(d)(1) or (d)(2), as applicable, following an engine failure occurring at any point on the intended takeoff flight path.	Working Group Report 9

JAR-OPS 1.500 En-route – One Engine Inoperative (See AMC OPS 1.500)	**FAR 121.191 Airplanes: Turbine-Engine-Powered: En route Limitations: One Engine Inoperative**	Working Group Report 10
(a) An operator shall ensure that the one engine inoperative en-route net flight path data shown in the Aeroplane Flight Manual, appropriate to the meteorological conditions expected for the flight, complies with either subparagraph (b) or (c) at all points along the route. The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after engine failure. In meteorological conditions requiring the operation of ice protection systems, the effect of their use on the net flight path must be taken into account.	(a) No person operating a turbine-engine-powered airplane may take off that airplane at a weight, allowing for normal consumption of fuel and oil, that is greater than that which (under the approved, one engine inoperative~~,~~ en route net flight path data in the Airplane Flight Manual for that airplane) will allow compliance with paragraphs (a)(1) or (2) of this section, based on the ambient temperatures and meteorological conditions expected en route.	
(b) The gradient of the net flight path must be positive at least 1000 ft above all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track.	(1) There is a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five nautical ~~statute~~ miles on each side of the intended track, and, in addition, if that airplane was certificated after August 29, 1959 (SR422B) there is a positive slope at 1,500 feet above the airport where the airplane is assumed to land after an engine fails.	
(c) The net flight path must permit the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be made in accordance with JAR-OPS 1.510 and 1.515 or 1.520 as appropriate, the net flight path clearing vertically, by at least 2000 ft, all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track in accordance with subparagraphs (1) to (4) below:	(2) The net flight path allows the airplane to continue flight from the cruising altitude to an airport where a landing can be made under § 121.197, clearing all terrain and obstructions within five nautical ~~statute~~ miles on each side of the intended track by at least 2,000 feet vertically and with a positive slope at 1,000 feet above the airport where the airplane lands after an engine fails, or, if that airplane was certificated after September 30, 1958 (SR422A, 422B), with a positive slope at 1,500 feet above the airport where the airplane lands after an engine fails.	
	(b) For the purposes of paragraph (a)(2) of this section, it is assumed that -	
(1) The engine is assumed to fail at the most critical point along the route;	(1) The engine fails at the most critical point en route;	
	~~(2) The airplane passes over the critical obstruction, after engine failure at a point that is no closer to the obstruction than the nearest approved radio navigation fix, unless the Administrator authorizes a different procedure based on adequate operational safeguards;~~	

		Working Group Report 10
(2) Account is taken of the effects of winds on the flight path;	(~~3~~2) An approved method is used to account ~~allow~~ for ~~adverse~~ the effect of winds;	
(3) Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome where the aeroplane is assumed to land after engine failure with the required reserves of JAR-OPS 1.255 appropriate to an alternate aerodrome, if a safe procedure is used, and	(~~4~~3) Fuel jettisoning will be allowed if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;	
(4) The aerodrome where the aeroplane is assumed to land after engine failure must meet the appropriate landing minima of JAR-OPS 1.297~~following criteria~~: ~~(i) The performance requirements at the expected landing mass are met; and~~ ~~(ii) Weather reports or forecasts, or any combination thereof, and field condition reports indicate that a safe landing can be accomplished at the estimated time of landing.~~	(~~5~~4) The alternate airport where the airplane is assumed to land is specified in the dispatch or flight release and meets the prescribed weather minimums~~; and~~.	
~~No corresponding requirement.~~	~~(6) The consumption of fuel and oil after engine failure is the same as the consumption that is allowed for in the approved net flight path data in the Airplane Flight Manual.~~	
(d) When showing compliance with JAR-OPS 1.500, an operator must increase the width margins of subparagraphs (b) and (c) above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.	No corresponding requirement.	

JAR-OPS 1.505 En-route – Aeroplanes with Three or More Engines, Two Engines Inoperative	**FAR 121.193 Airplanes: Turbine engine powered: En route Limitations for Airplanes with Three or More Engines: Two Engines Inoperative**	Working Group Report 10
	(c) *Aircraft certificated after August 29, 1959* (SR422B). No person may operate a turbine-engine-powered airplane along an intended route unless he complies with either of the following:	
(a) An operator shall ensure that at no point along the intended track will an aeroplane having three or more engines be more than 90 minutes with all engines operating at cruising power~~, at the all-engines long range cruising speed~~, at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met unless it complies with subparagraphs (b) to (f) below.	(1) There is no point along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.197.	
(b) The two engines inoperative en-route net flight path data must permit the aeroplane to continue the flight, in the expected meteorological conditions, from the point where two engines are assumed to fail simultaneously, to an aerodrome at which it is possible to land and come to a complete stop when using the prescribed procedure for a landing with two engines inoperative. The net flight path must clear vertically, by at least 2000 ft all terrain and obstructions along the route within 9. 3 km (5 nm) on either side of the intended track. At altitudes and in meteorological conditions requiring ice protection systems to be operable, the effect of their use on the net flight path data must be taken into account. If the navigational accuracy does not meet the 95% containment level, an operator must increase the width margin given above to 18.5 km (10 nm).	(2) Its weight, according to the two-engines-inoperative~~,~~ en route~~,~~ net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets the requirements of § 121.197, with the net flight path (considering the ambient temperatures and meteorological conditions anticipated along the track) clearing vertically by at least 2,000 feet all terrain and obstructions within five nautical ~~statute~~ miles ~~(4.34 nautical miles)~~ on each side of the intended track. For the purposes of this subparagraph, it is assumed that -	
(c) The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes, with all engines operating at cruising power ~~at the all engines long range cruising speed~~ at standard temperature in still air, away from an aerodrome at which the performance requirements ~~applicable~~ of JAR-OPS 1.515 or 1.520 at the expected landing mass are met, and where the landing distance available is not less than the unfactored two-engine-inoperative landing distance.	(i) The two engines fail at the most critical point ~~en route~~of that portion of the route where the airplane is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of § 121.197;	
(d) The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after the failure of two engines.	(ii) The net flight path has a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engines fail;	
(e) Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel	(iii) Fuel jettisoning will be approved if the certificate holder shows that the crew is	

reserves of sub-paragraph (f) below, if a safe procedure is used.	properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;	Working Group Report 10
(f) The expected mass of the aeroplane at the point where the two engines are assumed to fail must not be less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at least 1500 ft directly over the landing area and thereafter to fly ~~level~~ for 15 minutes at cruise power or thrust.	(iv) The airplane's weight at the point where the two engines are assumed to fail provides enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and thereafter to fly for 15 minutes at cruise power or thrust.~~, or both; and~~	
~~No corresponding requirement.~~	~~(v) The consumption of fuel and oil after the engine failure is the same as the consumption that is allowed for in the net flight path data in the Airplane Flight Manual.~~	

JAR-OPS 1.510 Landing – Destination and Alternate Aerodromes (See AMC OPS 1.510 and 1.515)	**FAR 121.195 Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports**	
(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodromes.	(a) No person operating a turbine engine powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight ~~to the destination or alternate airport~~) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the pressure altitude ~~elevation~~ of the destination ~~or alternate~~ airport and the ambient temperature anticipated at the time of landing. When the pressure altitude at the anticipated time of arrival cannot be determined from weather forecasts or reports, the elevation of the airport shall be used.	Working Group 11
(b) For instrument approaches with decision heights below 200 ft, an operator must verify that the approach mass of the aeroplane, taking into account the take-off mass and the fuel expected to be consumed in flight, allows a missed approach gradient of climb, with the critical engine failed and with the speed and configuration used for go-around of at least 2.5%, or the published gradient, whichever is the greater. The use of an alternative method must be approved by the Authority. (See IEM OPS 1.510(b)).	No corresponding requirement. (Go-around obstacle clearance will be addressed in the Obstacle Clearance Advisory Circular.)	

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)	**FAR 121.195 (continued)**	
(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold: (1) For turbo-jet powered aeroplanes, within 60% of the landing distance available; or (2) For turbo-propeller powered aeroplanes, within 70% of the landing distance available.	(b) Except as provided in paragraph~~s (c),~~ (d)~~, or (e)~~ of this section, no person operating a turbine engine powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight ~~(in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and wind conditions anticipated there at the time of landing)~~, would allow a full stop landing at the intended destination airport within 60 percent of the ~~effective length of each runway~~ described below from a point 50 feet above the landing threshold~~intersection of the obstruction clearance plane and the runway~~. For the purpose of determining the allowable landing weight, ~~at the destination airport~~ the following is assumed [this paragraph is completed after the proposed § 121.197 and § 121.195(c) in order to align with the JAR-OPS format for comparison purposes]: **FAR 121.197 Airplanes: Turbine Engine Powered: Landing Limitations: Alternate Airports** (a) No person may list an airport as an alternate airport in a dispatch or flight release for a turbine engine powered airplane unless ~~(based on the assumptions in § 121.195(b)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop within 70 percent of the effective length of the runway for turbopropeller powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction~~the requirements of § 121.195 can be met at the alternate airport ~~clearance plane and the runway~~. ~~In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel.~~ (b) In the case of an alternate airport for departure, as provided in § 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.	Working Group Reports 12 and 13.
(3) For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a)(1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less	No corresponding requirement.	Working Group Report 14

than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3).).		
(4) When showing compliance with subparagraphs (a)(1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see Appendix 1), the use of Short Landing Operations in accordance with Appendices 1 and 2 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.	No corresponding requirement.	Working Group Report 15
	FAR 121.195 (continued)	
(b) When showing compliance with subparagraph (a) above, an operator must take account of the following:	(c) For the purposes of showing compliance with paragraph (b) of this section, the following must be taken into account:	Working Group Report 12
(1) The altitude at the aerodrome.	(1) The pressure altitude of the destination airport;	
(2) Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and	(2) Not more than 50 percent of the headwind component or not less than 150 percent of the tailwind component; and	
(3) The runway slope in the direction of landing if greater than +/-2%.	(3) The runway slope in the direction of landing if greater than 2% uphill or downhill.	
	FAR 121.195(b) (continued)	
(c) When showing compliance with subparagraph (a) above, it must be assumed that:	For the purpose of determining the allowable landing weight, ~~at the destination airport~~ the following is assumed:	
(1) The aeroplane will land on the most favourable runway, in still air; and	(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air~~.~~	
(2) The aeroplane will land on the runway most likely to be ~~assigned~~ considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.515(c).).	(2) The airplane is landed on the ~~most suitable~~ runway considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.	
(d) If an operator is unable to comply with subparagraph (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with subparagraphs (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR-OPS 1.510 and subparagraphs (a) and (b) above.	No corresponding requirement.	
	FAR 121.195 (continued)	

(e) If an operator is unable to comply with subparagraphs (c)(2) above for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated which permits full compliance with subparagraphs (a), (b) and (c).	(~~c~~d) An ~~turbopropeller powered~~ airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all of the requirements of this section ~~except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway~~. ~~A turbojet powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.~~	
JAR-OPS 1.520 Landing – Wet and Contaminated Runways	**FAR 121.195 (continued)**	
(a) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet or contaminated, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR-OPS 1.515.	(~~c~~d) ~~Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, N~~no person may take off a ~~turbojet~~ turbine engine powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may not be ~~wet or slippery~~dry at the estimated time of arrival unless the ~~effective runway length~~landing distance available at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.	Working Group Reports 12, 13,and 16.
~~(b) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance available must be at least the landing distance determined in accordance with subparagraph (a) above, or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater.~~	No corresponding requirement.	
~~(c)~~(b) A landing distance on a wet or specially prepared runway shorter than that required by subparagraph (a) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.	(f) A landing distance on a wet runway with a landing distance available shorter than that required by paragraph (f) of this section, but not less than that required by paragraph (b) of this section, may be used if a shorter wet runway landing distance has been approved for a specific type and model airplane and included in the Airplane Flight Manual.	Working Group Report 16.

~~A landing distance on a specially prepared contaminated runway shorter than that required by subparagraph (b) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on contaminated runways.~~	No corresponding requirement.	
(~~e) When showing compliance with subparagraphs (b), (c) and (d) above, the criteria of JAR-OPS 1.515 shall be applied accordingly except that JAR-OPS 1.515(a)(1) and (2) shall not be applied to subparagraph (b) above.~~	No corresponding requirement.	